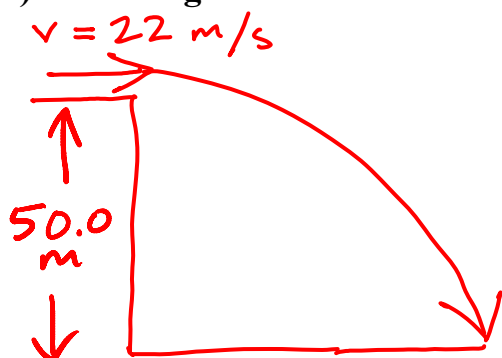


Example 4.

A car going 22.0 m/s runs off a 50.0 m-high cliff.

a) How long does the car take to hit the ground?



Hor	Vert
$v_{av} = 22$	$v_o = 0$
$a = 0$	$a = -9.8$
	$d = -50$
	$t = ?$

→ using vertical info,

$$d = v_o t + \frac{1}{2} a t^2$$

$$-50 = \frac{1}{2} (-9.8) t^2$$

$$t = 3.2 \text{ s}$$

b) What is the range of the car?

range = horizontal displacement

$$d = v_{av} t$$

$$= 22(3.2)$$

$$d = 70. \text{ m}$$

c) With what speed and direction does it hit?

→ horizontal speed = 22 m/s (constant)

→ to find final vertical speed, use

$$v_0 = 0$$

$$a = -9.8$$

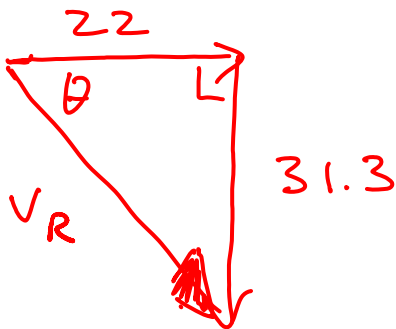
$$d = -50$$

$$v^2 = \cancel{v_0}^0 + 2ad$$

$$v = \sqrt{2(-9.8)(-50)}$$

$$v = 31.3 \text{ m/s}$$

Now find final resultant speed:



$$v_R = \sqrt{22^2 + 31.3^2}$$
$$= 38.3 \text{ m/s}$$

$$\theta = \tan^{-1} \left[\frac{31.3}{22} \right]$$
$$= 54.9^\circ$$

So $v_R = 38 \text{ m/s @ } 55^\circ \text{ down}$